30791

OTS: 60-11,424

JPRS: 2416

23 March 1960

SCIENTIFIC AND TECHNOLOGICAL NEWS

-COMMUNIST CHINA-

Distributed by:

OFFICE OF TECHNICAL SERVICES
U. S. DEPARTMENT OF COMMERCE
WASHINGTON 25, D. C.

Price: $0.75

U. S. JOINT PUBLICATIONS RESEARCH SERVICE
205 EAST 42nd STREET, SUITE 300
NEW YORK 17, N. Y.

JPRS: 2416

CSO: 3403-N

SCIENTIFIC AND TECHNOLOGICAL NEWS

[The following are translations of selected articles appearing in K'o-hsueh Hsin-wen (Science News), No 34, Peiping, 28 October 1959, pages 10-14.]

TABLE OF CONTENTS

Article	Page
I. The Observation and Prediction of Artificial Satellites	1
II. The Successful Pilot Manufacture of Four Kinds of Radiation Instruments	3
III. The Building of 30,000 Atmosphere, Liquid Medium, High-Pressure Equipment	5
IV. Protection Against Radioactive Substances	8
V. The Study of Solid Emitters, Achievement During the Big Leap Forward	9
VI. Electron Microscope	14
VII. New Remote Control - Remote Signalling Equipment	17

[The following is a full translation of an article appearing in K'o-hsueh Hsin-wen (Science News), No 34, 28 October 1959, page 10.]

I. The Observation and Prediction of Artificial Satellites

With the Tzu-chin-shan Observatory as center, the organization of the work of observation and prediction on artificial satellites was started in China as early as the end of 1957. Before that time, the Soviet Union had presented to us 180 sets of Model AT-1 wide angle telescopes, and two sets of artificial satellite, precision photographic equipment. It helped us to establish 12 optical observation stations and provided us periodically with observation predictions.

During the big leap forward, China's artificial-satellite observation work made flying developments during the more than one year which elapsed. By the beginning of 1959, the number of artificial satellite observation stations in China had increased to 26, and were distributed all over the country.

Based on incomplete statistics, China had made a total of 4,464 wide angle telescopic observations and 250 photographic observations of the three artificial satellites of the Soviet Union as of the end of July 1959. The data of these observations have been very significant to the observation and research work on artificial satellites.

To coordinate with the development of the artificial-satellite observation and theoretical research work, China has gradually established its own prediction work. Owing to a lack of observation data and an incomplete grasp of the laws of orbital variation, the prediction was very inaccurate at the beginning.

The error was often as great as 10 degrees. However, the establishment in China of an artificial-satellite observation network and the gradual accumulation of observation data have created the necessary conditions for research work, and during the more than one year period we

have processed a large quantity of observation data and have carried out a systematic analysis on theories of orbiting and orbital variation laws of artificial satellites. As a result, the accuracy of our prediction has improved continuously.

On short term predictions, the accuracy in time had reached ± minute, and the accuracy in position had reached ±1 degree as early as by the end of 1958. At present our accuracy on long term predictions of around 15 days has also reached ±3 minutes and ±5 degrees. Consequently, whether it is in terms of the length of the prediction period or in terms of accuracy, we are already close to the international level.

Because of changes in orbit and the changes in sunlight, the "optical visible period" of artificial satellites occurs intermittently. Based on the orbital variation laws, the young comrades of the Tzu-chin-shan Observatory artificial satellite group have completed a visible-period prediction report on the Soviet Union's third artificial satellite, extending all the way to the beginning of 1960. Not only does this type of long-term prediction have a very high practical value arranging observation and research work in different parts of China, but it also indicates a definite academic level.

[The following is a full translation of an article submitted by Hu Tsu-hua, Lan-chou Physics Research Office, Academia Sinica. This article appears in K'o-hsueh Hsin-wen (Science News), No 34, 28 October 1959, page 10.]

II. The Successful Pilot Manufacture of Four Kinds of Radiation Instruments

To thoroughly carry out the policy of scientific research serving socialist economic construction and national defense construction, the Lan-chou Physics Research Office of the Academia Sinica studied and pilot-manufactured in a period of one year, during the big leap forward, four kinds of radiation instruments to serve mineral exploration and uses in radioactive isotopes.

To facilitate wide application,and from the standpoint of economy and suitability, we have produced simple instruments from early obtainable raw materials. On the other hand, we have also studied and pilot-manufactured semiconductor and cold cathode "cha-liu" [literally, dam flow] tube types. These are introduced separately as follows:

The two simple types: one is copied, using a 400-volt dry cell to provide the voltage. The other type is an improved model with high voltage produced by a "t'ing-sai" [literally, stopping and blocking] oscillator composed of an electronic tube and a transformer. Both rely on the "lo-lo" sound in the earphones and the flashing of neon lights to locate substances emitting gamma radiation, although they cannot accurately measure the intensity of radiation. Their special characteristics are: simple construction, ease of checking and repairs, low cost, and suitability for the general exploration of uranium.

Imitation of Soviet electronic tube type: electronic tubes are used for both the high-voltage section and the counting section, and all the materials used are produced in China. High voltage is produced by a "t'ing-sai" oscillator and the counting section is composed of an amplitude regulator and a vacuum tube voltmeter. Measuring method: by means of earphones, the intensity of radiation can more

or less be determined. However, the use of an electrometer will more accurately measure the intensity of radiation. The instrument has two measuring ranges, the first range being 2 "hao-lun" [milli-curies?] per hour and the second range 0.3 "hao-lun" per hour. The time for equilibrium of the instrument is 15 seconds for the first range and 25 seconds for the second range.

Semiconductor crystal of the triode or diode type: crystal triodes and diodes are used for both the high voltage and the counting sections. Power is supplied by flashlight batteries and pen batteries. The method of measurement is as for the electronic tubes. Their measuring ranges are: (1) 9.1 - 1.04 "hao-lun" per hour; (2) 6.75 - 0.17 "hao-lun" per hour; and (3) 0.27 - 0.065 "hao-lun" per hour. Their special characteristics are: small volume, long life and sturdiness.

Cold cathode "cha-liu" tube type: manufactured with two MTKH-90 cold cathode "cha-liu" tubes and four 90-volt dry cells. With regard to the method of measuring, in addition to the earphones and electrometer the intensity of radiation is also determined from the current discharge frequency of the cold cathode "cha-liu" tube. Measuring ranges: the first range is 0 - 2,000 "wei-lun" [micro-curies?] per hour and the second range is 0 - 500 "wei-lun." Its special characteristics are: simple construction, saving in materials, economical and suitable.

Among the above described types, the last two are more modern and, moreover, low in cost. Since China is now engaged in the large-scale production of crystal tubes, high conducting magnetic cores, cold cathode "cha-liu" tubes, and 400 volt, small dry cells, they are suitable for large-scale production and we may say that this will be the future direction of radiation instrument development.

[The following is a full translation of an article appearing in K'o-hsueh Hsin-wen (Science News), No 34, 28 October 1959, page 11.]

III. The Building of 30,000 Atmosphere, Liquid Medium, High-Pressure Equipment

The physics of ultra-high-pressure is the study of the law of changes of matter under continously increasing pressure. In other words, it is a study of the various properties of matter under compression state (such as their mechanical, electrical, magnetic and optical properties and their structure changes, etc.). It is the search for the various phenomena of matter under ultra-high-pressure, and for an ultra-high-pressure technique indispensible to carrying out this type of research.

When we speak of ultra-high-pressures in physics, was generally refer to pressures of more than a few thousand atmospheres with no upper limit. The high pressure now achieved in a laboratory is approximately 500,000 atmospheres. The study of high-pressure physics has already provided us with some valuable results. For instance, we already know that the strength of metals is greatly increased, as much as double the original value, after they have been subjected to pressure of 8,000 atmospheres. Moreover, physico-chemical effects and phase changes under high pressures have also opened up a new road for the synthesis of new materials.

We already know that graphite can be transformed into diamond under a pressure of 100,000 atmospheres and a temperature of 2,000 degrees. People are, therefore, becoming more and more interested in high-pressure physics.

Most of the laboratory research on physical properties under high pressure is done in the range of 30,000 to 100,000 atmospheres. Even at the ultra-high-pressures in this range, there still exist experimentally very great technical difficulties and limitations and many problems are still awaiting to be studied.

The subject of ultra-high-pressure physics was originally a blind spot in China. Actually, our contact with "ultra-high-pressure" began during the big leap forward, in the second half of 1958. At that time some preliminary work was done in conjunction with the work of super hard crystals through high-pressure synthesis.

On the strength of the basic work of 1958, we started the building of 30,000 atmospheric pressure equipment in April 1959. This equipment was built to carry out even more physical measurements and research. It was different from the ultra-high-pressure equipment built in 1958 (the pressure attained in 1958 greatly exceeded 30,000 atmospheres); the volume of the container was some 10 times larger.

Once the volume became large, various parts of the equipment also became extremely large. The medium used was no longer a solid; instead, a liquid medium had to be used. Consequently, to guarantee that the liquid would not leak at all under a pressure of 30,000 atmosphere, it became necessary to overcome sealing difficulties.

When a liquid is subjected to a pressure of 30,000 atmospheres, its volume is reduced to only one half its original size. It is, therefore, not like a solid to which a pressure of 30,000 atmospheres could be successfully applied in one stage.

A set of complicated supplementary equipment becomes necessary to provide the container with a pressure of over 4,000 atmospheres before the main compressing machine takes over. In addition, it is necessary to have seven electrode lead wires to be used in heating and in the measurement of temperature and pressure.

On the basis of these characteristics, it was necessary first to solve the problem of basic equipment and the problem of insufficient knowledge of high-pressure techniques. All our comrades participating in the work of ultra-high-pressure did not have much experience in this field.

However, under the encouragement of the Party's general line and through the big-leap-forward movement, and the realization of the problems of people's communes in 1958, our confidence in the building of this equipment was greatly strengthened. Furthermore, we all felt that to be able to shoulder the task of building ultra-high-pressure equipment for the first time in our vast fatherland was extremely glorious.

We, therefore, strengthened our determination and did whatever was necessary. There were very few ready-made instruments we could buy; every major part was designed and fabricated from raw materials. As a result, through the efforts of comrades and the vigorous assistance of brother units, we designed a set of 300-150 ton "double head" compressing machines which took only a little over a month to build.

The building of the heart of the ultra-pressure-equipment -- the high-pressure container -- was also started from raw materials. The requirement in fabrication precision was very high and the fabrication steps were also numerous. Many of these could not be solved immediately with existing equipment. However, through comrades' efforts and their finding of suitable ways, the high-pressure container was finally completed.

Based on foreign equipment, a set of supplementary compressors to produce 6,000-10,000 atmospheres of pressure would still be needed. It was obviously impossible to accomplish this task within a short time if we were also to follow this procedure. "orking comrades did not feel discouraged under these difficulties. They racked their brains and looked for ways and finally were able to avoid in the design, the need to use this set of complicated supplementary equipment.

After few failures and tests, a stable pressure of 25,000 atmospheres and an upper limit of 28,000 atmospheres have been reached with this set of ultra-high-pressure equipment. In a period of close to six months, we have completed the preliminary building on Chinese land of 30,000 atmosphere, liquid medium, high-pressure equipment.

[The following is a complete translation of an article prepared by Hu Tsu-hua, Lan-chou Physics Research Office, Academia Sinica. This article appears in K'o-hsueh Hsin-Wen (Science News), No 34, 28 October 1959.]

IV. Protection Against Radioactive Substances

With the development of atomic energy undertakings, the chances of uranium entering the human body have greatly increased. To study the prevention against internal radiation, in order to guarantee the health of the human body, the Lan-chou Physics Research Office of the Academia Sinica has carried out this research work.

This test was carried out on large, white, male rats. A specific dosage of uranium nitrate was injected into the visceral cavity. After a certain time, the rat was killed and its kidney , liver, lung, heart, spleen, flesh, cerubrum and tibia were collected and made into radiation tissue pieces. These were observed and analyzed by fluoroscopy.

From the results of observations during the experiment, it was found that combined uranium existed in the various internal tissues and various parts of the central nervous system of the organic body. It is worthwhile to point out that the amount of combined uranium and protein is greatest in the kidney,which may be explained by the symptoms of such illnesses as the inflammation of the kidney and the urethra.

Smaller amounts are found in the bone and liver tissues and still smaller amounts are found in the spleen and stomach tissues. The smallest amount of protein-combined uranium is found in the various parts of the central nervous system.

This experiment has paved the way for present and future research for a way to speed up the discharge of uranium from the organic body; namely, all factors which affect the metabolism of protein in the body have the possibility of speeding up the metabolism [probably, discharge] of uranium which will reduce the harm of radiation to a person's physical health.

[The following is a complete translation of an article submitted by the Physics Research Institute, Academia Sinica, appearing in K'o-hsueh Hsin-wen (Science News), No 34, 28 October 1959, page 12.]

V. The Study of Solid Emitters, Achievement During the Big Leap Forward

Solid emitters occupy an important position in the national economy and in scientific techniques. Such electronic-beam instruments as television and radar must have solid emitters to make a fluorescent screen before they can show the loci swept by the electronic beam, thereby showing us pictures and phenomena with which we are concerned.

Only with emitters of very strong intensity and very high efficiency can fluorescent lights be manufactured, thereby saving three to four times the electric power needed.

In recent years field induced emitting phenomena has received an increasing amount of attention. When an emitter is held between two electrodes and a potential is applied, it will emit light. Since the emitting of light is achieved under the action of an electric field, it is called field induced emitting.

This type of material, together with a photoelectric conducting material, can be used to make an image intensifier--to change a weak image (such as the image of a lung X-ray) into a bright image. It can also be used to produce a large-size television screen which does not require a vacuum.

There is also the possibility that it can be used to build a large-area (like the side of a wall) "light," thereby bringing about a gigantic revolution in lighting techniques.

The Physics Research Institute of the Academia Sinica started the establishment of a solid-emitting laboratory

as early as in 1958. After these years of development, this laboratory is now able to carry out various types of research on solid emitting. Outstanding achievements have been accomplished during the relatively short period since the big leap forward of 1958, two of which are most important. These are the improvement of the efficiency of field induced emitters and the production of a long emitter with an extremely long residual glow.(1)

(1) Field induced emitters

A fluorescent lamp changes electric energy into ultraviolet rays and then to visible light. But a field induced emitter can change electric energy directly into visible light. Since this means one less energy conversion process than the fluorescent light, theoretically there is a possibility that the efficiency of lights made from this type of material is even higher than that of a fluorescent light, and even more electric current will be saved.

However, the efficiency of every field induced emitter we know today is very low. Not only does it not compare with a fluorescent light, it cannot even compare with the ordinary electric light. Consequently, the production of field induced emitters of even higher efficiency is the key problem influencing the wide application of field induced emitting.

The efficiency of a light is ordinarily calculated in "lumen/watt" units where the lumen is a quantitative unit of light. The unit of efficiency, therefore, expresses the amount of light emitted for the consumption of 1 watt of electric energy. The efficiency of an ordinary fluorescent light is around 50 lumens/watt and that of an ordinary electric light 12-15 lumens/watt.

The Physics Institute of the Academia Sinica initially manufactured a field induced emitter with an efficiency

(1) Some emitters are capable of emitting light even after ultraviolet rays (or other forms of excitation) have been stopped. Light emitted thus is called residual glow.

of around 15 lumens/watt in a period of three months during the big leap forward of 1958. When the [consumption by the]medium (insulating material) mixed with the emitter was deducted, the efficiency of the emitter alone was estimated at as high as 20 lumens/watt.

Through the continued progress of this year of 1959, achievements attained in 1958 have already been strengthened. This is also to say that we are able to make this material with confidence. Based on our available information, the efficiency of the best material which emerged internationally in 1958 was 14 lumens/watt (with the consumption by the medium already having been deducted).

Of course, this type of material is still very far from what can actually be used, since the above mentioned efficiency was obtained under the condition of a very high alternating frequency. If the ordinary alternating current is used, the efficiency will be very much lower.

Secondly, the color of light emitted by this type of material is not white, and materials used for lights must emit a white light. Moreover, its light emitting intensity is not even high enough under a frequency and voltage which provide the highest efficiency. For these reasons, a great deal of further efforts must be exerted in order that field induced emitters may be used for lighting purpose. However, that an emitter of such high efficiency has been produced in a little more than one year cannot be said not to be a very big leap forward.

(2) Long emitters.

The longer the residual glow of an emitter, the longer it will emit light. One which has a residual glow of several hours is called a long emitter. Sunlight contains an abundant amount of ultraviolet rays. Consequently, after being subjected to the rays of sunlight (either directly or indirectly), a long emitter is able to store up the sunlight and slowly emit it. If the residual glow of an emitter is as long as some 10 hours, it will be able to emit light all night.

This type of material can replace the permanent type of emitter used on luminous watches. It utilizes the sunlight directly and is not the same as a permanent emitter where an expensive radioactive substance must be added. This type of material is, therefore, extremely suitable where a very high light intensity is not required.

During the big leap forward of 1958, four young comrades of the Physics Institute with high school education spent less than two months in producing a type of long emitter which maintained an intensity above 2/1000 "ya-p'ao-ssu-t'i-erh-pu" (2) 13 hours after it had been exposed to ultraviolet rays.

When painted on an area of 200 square centimeters, this material was still visible eight hours after sunset at a distance of 30 meters. As a result of the continued progress in this year of 1959, the intensity of the material has been further improved by more than three times, namely to 7/1000 "ya-p'ao-ssu-t'i-erh-pu" and, moreover, we have every confidence in producing this material.

However, when submected to the influence of infrared rays, the emitting power of this material deteriorates. Since considerable amounts of infrared rays exist in white light, the result is different when the material is subjected to sunlight from when it is subjected to ultraviolet rays alone. Its intensity is lower when it is subjected to sunlight and efforts are being made to improve this point.

There have been no international publications on long emitters during recent years. The more detailed information is dated 1949, and the intensity attained at that time was 6/1000 "ya-p'ao-ssu-t'i-erh-pu."

(2) "Ya-p'ao-ssu-t'i-erh-pu" is an intensity unit and is equal to an emission of 1/1000 lumens of light per square centimeter of area. When reading under light, the light intensity on the paper is about 100 "ya-p'ao-ssu-t'i-erh-pu" and the light intensity of snow on the ground on a clear but moonless night is about 15/10000 "ya-p'ao-ssu-t'i-erh-pu."

The uses of long emitter are countless. They can be used as navigation markers [for airplanes], road markers, in luminous watches, on house number plates, and seat numbers in theaters. They are also useful for military purposes, in communication, and in daily life.

[The following is a complete translation of an article submitted by the Research Institute on Optical Precision Equipment and Instruments appearing in K'o-hsueh Hsin-wen (Science News), No 34, 28 October 1959, page 13.]

VI. Electron Microscope

The electron microscope is an instrument, developed after the optical microscope, with which we are able to directly observe even smaller bodies. It utilizes the theory of magnification of an electronic image which has passed through an electromagnetic lens. The wave length of the electrons as a result of high voltage acceleration is much smaller than that of visible light.

Consequently, the resolving power and magnification of an electron microscope are many tens of times greater than in an optical microscope and it has enjoyed wide applications in biology, medicine, metallurgy, chemistry, and physics. It can be used to observe the structures and large single molecules of virus, high molecular weight compounds, and molecular crystals; to study the surface structures of metals and alloys, the deformation of metals and surface corrosion, and it has a great significance in the national economy.

The electron microscope is an extremely complicated instrument of great precision. It empolys many new achievements from such modern scientific techniques as electron optics, precision equipment, high vacuum technique, radio electronics, high and stable voltage, and stable current techniques.

The magnification of the electronics section of a large electron microscope is 100,000, and that of the optics section is 5X and 10X. The resulting over-all magnifications are therefore 1,000,000X and 500,000X. The design of this large electron microscope was completed independently, in one month by the young scientific workers of the Research Institute on Optical Precision Equipment and Instruments based on the medium-sized electron microscope manufactured in 1958, and through the Party call for a

spirit of "dare-to-think and dare-to-act." Participation in this work also included such cooperating units as the Shanghai Precision Therapeutic Equipment Plant and the Electronics Research Institute of the Academia Sinica.

The design of the large electron microscope has been made independently through the adoption of the most advanced electromagnetic theories, by incorporating special characteristics of the finest electron microscopes in the world, and by taking into consideration China's needs. Because of the strong and determined leadership of the Party and the sky-rocketing spirit of the comrades, China's large electron microscope made its appearance in the world in less than half a year, and with initial adjustments it has already attained a resolving power of 25 Angstroms and the superior record of 100,000X magnification.

The work on the large electron microscope was carried out under shortages of technical knowledge, manpower and material, Many difficulties were encountered and 20 major obstacles were overcome. The most important technical problems solved were:

(1) Material for the objective lens "chi-hsueh" [literally, electrode shoe], fabrication and aperture measurement. The objective lens is the heart of the entire electron microscope and decides the quality of the instrument. It requires a better magnetic conducting material--ferro-cobalt alloy, which had never been made anywhere in China before.

So the comrades went ahead to produce the alloy themselves, and through the support of the Metals Research Institute were finally able to produce a material which met all the requirements. The fabrication of the objective lens requires very high precision. The ellipticity, concentricity and verticality of the upper and lower objective lens must be precise to almost 0.1 microns.

Not only had we no data on this subject, we also had no measuring instrument. The comrades, therefore, utilized the existing length measuring machine, modified it and, thus, solved the problem of measurement according to the principle: "more, better, faster, and cheaper."

The degree of precision of fabrication was also attained through the efforts of the comrades.

(2) High voltage power source, 100,000 volt: the high voltage power source is the motive power for the operation of the electron microscope. Not only is a high voltage required, but it must also have a high degree of stability. In the process of manufacture, we immediately encountered, and could not solve, the problem of high voltage condensers and high resistors.

Condensers ordered and procured were damaged five or six times, so we eventually remodeled some condensers we had and were able to produce a 100,000 voltage current. Moreover, the degree of stability attained for a voltage of 60,000 volts was 5×10^{-5}.

(3) Successful experimentation on mechanical arm and projector lens "huan-chi-hsueh" [literally, change electrode shoe] installation: Not only are high precision and good maneuverability required of the mechanical arm and projector "huan-chi-hsueh" installation, they must also operate under vacuum; and the vacuum must be maintained when changing samples. Through repeated test and changes we were eventually successful with this equipment.

(4) Adjustment and centering: the proper adjustment of an electron microscope directly affects its quality. Not only must every lens of the electron microscope be parallel, but the optical axis of every lens must also be in the same straight line. These are checked by image adjustment. For the adjustment and centering alone, the electron microscope had to be taken apart many tens of times.

The fact that the Institute has been able to produce an electron microscope with a resolving power of 25 Angstroms is indeed a happy event. Although it cannot yet compare internationally with the advanced models, we believe that after another period of adjustment an electron microscope of even more superior properties will be made to serve socialist construction enterprises.

[This is a full translation of an article written by Chin Yuan-ch'ing of the Wuhan Power Supply Station. The article appears in Hua-hsuen Hsin-wen (Scientific News), No 34, 28 October 1959, page 14.]

VII. New Remote Control - Remote Signalling Equipment

This installation is evolved from the Soviet Union's latest RST model remote control, remote signalling installation. Its pilot manufacture was completed by utilizing the experience of successful pilot manufacture undertaken by the Ministry of Hydropower's Peiping Technical Improvement Bureau in 1958, by taking into consideration currently available equipment and by suitable modifications of its wiring connections.

The basic operating theory of the installation is that of the "non-selection group" type of long-distance equipment, and it was designed according to the direct selection theory of the telegraph code distribution system. When operating, a series of positive and negative impulses and intermittent signals are sent along the course and the selection of the remote control and remote signalling objective is accomplished by the method of forming long intervals.

The installation is used principally to provide "locomotion" for power systems. The entire equipment consists of two halves of a single installation, separately installed at the regulating station and the controlled station. Contact between the two may be by means of wire connection or electric wave carrier connection. The installation is capable of reliably carrying the transmission of "orders" from the regulating station to the controlled station, and of "reports" from the controlled station to the regulating station.

In the transmission of "orders" the following work can be accomplished:

(1) The remote control of the operating equipment at the controlled station by the regulating station (such as

the jumping or closing of switches of the interrupter, the starting or stopping of a group of equipment).

(2) "Calling long distance measuring" - remote measuring.

(3) "Inquiring-calling" for periodic report transmission by the controlled station.

In the report transmission, the following work can be accomplished:

(1) After carrying out the orders transmitted from the regulating station, answering signals are transmitted immediately [by the controlled station].

(2) Transmit automatic signals on the positional changes of the controlled equipment (such as the automatic change of position of the interrupter); transmit automatic signals regarding the movement of automatic installations (such as APV or AVR) and the changes of state of equipment being supervised in the controlled station (such as the single phase grounding of small current grounding system, and the overloading and overheating of transformers.)

2. Technical properties

The principal parts of the installation consist of the RPN model electromagnetic relay and the "step advancing system" selector. Others include the selenium rectifying plate used as an electrical valve, and condensers and resistors used to regulate time parameters. It also includes resistors used to limit the current in the return circuit.

3. Advantages and disadvantages of installation

Advantages:

(1) Since the two halves of the installation participate closely with each other in the operation, the wiring and protective arrangements for either type of transmission (remote control or remote signalling) are greatly simplified.

(2) Because of the special characteristics of the installation's wiring, any lengthening or shortening of the interval caused by changes of the time parameter of the relay would not affect the accurate operation of the installation.

(3) Requirements of the time parameter of parts are not too high, thus comparatively simplifying adjusting and experimental work.

Disadvantages:

(1) When the installation operates without limit [out of control], the power source cannot be cut off automatically (lack of a thermocouple relay). However, the power source of the installation can be cut off manually by the attendant at the regulating station.

(2) There is no counting equipment and consequently, the accurate operational rate of the installation is not easily determined.

(3) When a remote control order is not accurately carried out (e.g., when the remote control and remote control objective relays do not start to operate or, after they have started to operate, do not maintain their operation), the installation cannot automatically inquire. In such cases, the only way to correct the situation is to inquire manually.

Principal data:

Insatallation capacity (number of objectives)			Signal transmitting time (seconds)			Maximum D.C. consumption (amperes)	
Remote control	Remote signalling	Remote* measuring	Remote control	Remote** signalling	Inquiring	Regulating station	Controlled station
16	20	--	3.7	4.6	6.3	1.25	0.9

*If remote measuring of the controlled station is desired, this can be accomplished by adding certain necessary parts and using the number of objectives reduced from those under remote control.

**30 percent of the positions of objectives is in an isolated condition.

1524 END